A bio-sourced tool kit to defuse the Cr(VI) threat in wastewater

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The presence of chromium in waterbodies is a risk for human health and the environment. Especially in tannery operations chromium is still in use in relevant quantities. Polymeric adsorbents that can be used for the adsorption of heavy metal ions from industrial effluents are often not biogenic. We investigated how to produce porous lignin-based thermosets for the adsorption of heavy metal ions (chromium in our case) from water as a greener alternative. Amino-functionalised (triethylenetetramine) porous lignin monoliths were produced by polymerizing an emulsion template containing untreated kraft black liquor (as industrially produced) with oxirane-crosslinkers (green poxy and epichloro hydrin). The adsorbents bare inherent chemical functionality for the adsorption/chemical binding of transition metal ions due to the use of triethylenetetramine. We tested our material for removal of Cr(VI) ions from water and simulated waste water. We found good adsorption of chromium ions, as well as the reduction of dangerous Cr(VI) to harmless Cr(III) upon adsorption. The monoliths were tested in static and continuous adsorption experiments and chromium removal from water and synthetic wastewater was quantified. The materials that we made incorporate mostly bio-carbon due to the use of bio-sourced oxiranes together with lignin contained in black liquor. Only the amine crosslinker is not biogenic.

Keywords: Lignin, water purification, wastewater

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References

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